

REPORT UPON THE ANNELIDA POLYCHÆTA OF BEAUFORT,
NORTH CAROLINA.

BY

E. A. ANDREWS, PH.D.

(With Plates XII-XVIII.)

The Annelid fauna of the northeastern coast of the United States has become so well known through the labors of A. E. Verrill, H. E. Webster, and others, that our ignorance of that of the southern Atlantic States is the more striking by contrast. South of Northampton County, Virginia, where Webster, in 1874 and 1876, obtained some fifty-nine species of Polychæta, described in his *Annelida Chætapoda* of the Virginian coast, but very little has been published respecting the littoral Annelid fauna, though the European descriptions of forms collected in the West Indies, the collection of Professor Goode in Bermuda of twenty-six species, described in the *Bulletin of the U. S. National Museum*, 1884, and the extensive monograph of Ehlers on the Annelids dredged by the Coast Survey steamer *Blake* off the Florida coast (*Mem. Mus. Com. Zoöl.*, Harvard, 1887) give a few general grounds for anticipating some of the discoveries to be expected along the shores of the Southern States.

In this region, Charleston Harbor was carefully examined by the French naturalist, L. A. G. Bose, toward the close of the last century, with the result that several interesting Annelids were made known, among them being the new genus *Polydora*. Later Stimpson (*Proc. Boston Soc. Nat. Hist.*, 1856) described two new Annelids from this same interesting locality, one being the remarkably large *Acoetes lupina*. Farther north, at Fort Macon, near Beaufort, North Carolina, Coues and Yarrow collected marine Annelids, nine species of which were described by Verrill in 1878 (*Proc. Acad. Nat. Sci. Phila.*).

In the following list some fifty-seven species, representing twenty-four families of Polychæteous Annelids, are identified and described, with such notes upon breeding, habits, color, etc., as were made at that time, the collection being obtained in connection with the Johns Hopkins Marine Laboratory, Beaufort, North Carolina, in the summer months of 1884 and 1885. As the collection was confined to a short part of the year, was for the most part limited to the area between tides, and not conducted with any great thoroughness, the list must obviously give but

an inadequate idea of the richness of the fauna. Reinvestigation would doubtless show the fauna to be as well represented by numerous species, as it obviously is by innumerable individuals, the sand flats presenting a most striking illustration of the wealth of Annelid life that may be supported under the exceptionally favorable conditions here prevailing.

Family AMPHINOMIDÆ.

AMPHINOME Brugnieres.

Amphinome rostrata Quatrefages.

QUATREFAGES. Hist. Nat. des Annelis, vol. 1, p. 393.

Small and apparently immature specimens of *Amphinome* were found on several occasions among the stalked barnacles upon driftwood brought into the harbor by certain winds, and referred, with considerable doubt, to the form *Quatrefages* seems to have had for the above description.

The coloring of the body suggests a protective resemblance to the stalks of the barnacles among which the Annelid lies concealed, though Langerhans thinks that the conspicuous colors of certain members of this family are useful as a warning signal, some having, he says, poisonous setæ.

Family POLYNOIDÆ.

LEPIDONOTUS (Leach) Malmgren.

Lepidonotus sublevis Verrill.‡

VERRILL. Invert. Animals, Vineyard Sound, p. 320, 581, Pl. x, Fig. 42.

VERRILL. New England Annelida, Part I, Pl. vi, Figs 4, 4a, 4b, 4c.

Small specimens are not uncommon in material dredged in shallow water, both inside and outside of the inlet, and were taken both in 1884 and 1885.

Lepidonotus variabilis Webster.

WEBSTER. Annel. Chæt. Virginian Coast, p. 58, Pl. vii, Figs. 6-11; Pl. ii, Figs. 12-14.

This occurs upon oyster shells, etc., in shallow water. It was taken at "Green Rock," in June, among hydroids; upon the bottom of a floating scow, off Schackelford Bank, in August; near "Horse Island," and among sponges dredged near Moorhead City, in June.

HARMOTHÖE Malmgren.

Harmothœ aculeata, sp. nov.

(Plate XII, Figs. 1-5.)

Body long, much flattened; setigerous somites, 34. Cephalic lobe deeply cleft. The two lobes swollen and with the acuminate tips sharply distinguished. Anterior eyes larger than posterior, opposite posterior end of median cleft. Median tentacle more than twice the length of the

antennæ; the latter slender, not much exceeding cephalic lobe. Tentacular cirri more slender than tentaculum. Palpi much stouter and smooth, unless highly magnified.

First pair of elytra round; following ones oblong, somewhat wider at outer part and emarginate on anterior edge; outer and posterior edges with dense fringe; surface covered with spines, which are small and surrounded by a circular area on the smooth anterior region, while they become larger, sharp, and surrounded by polygonal areas upon the posterior part of the elytra. Here the polygonal areas bear smaller spines or nodules near the edge. The large spines as well as small ones are often bifid and form near posterior edge of elytrum a linear series evident to naked eye.

Dorsal cirri, tentaculum, and antennæ densely papillated, but ending in smooth filiform tips. Ventral cirri small, slender, somewhat papillated. Dorsal setæ as in *H. imbricata* Malmgren. Ventral setæ with nearly straight tips and prominent hooks some distance below.

Length up to 2 centimetres; diameter, including setæ, 8 millimetres.

The most common scale-Annelid found under stones, etc., in shallow water and between tides, near the town. It was also dredged among sponges near Horse Island and at Green Rock, in June and October.

NYCHIA Malmgren.

Nychia cirrosa Malmgren.

MALMGREN. Nordiska Hafs-Annulata, p. 58, Pl. VIII, Fig. 1.

WEBSTER. Annel. Chet., Provincetown, p. 700.

TAUBER. Annulata Danica, pp. 79-80.

Only one specimen was taken, 1884.

LEPIDAMETRIA Webster.

Lepidametria commensalis Webster.

WEBSTER. Annel. Chet. Virginian Coast, pp. 10-13, Pl. III, Figs. 23-31.

WEBSTER. Annel. Chet., Provincetown, p. 701.

Only a single specimen of this interesting commensal annelid was taken in the tube of an amphitrite, found in the mud flat alongside the channel at Crab Point, in June, 1885.

Family SIGALIONIDÆ.

STHENELAIS Kinberg.

Sthenelais picta Verrill.

VERRILL. Invert. Anim. of Vineyard Sound, p. 348, 582.

VERRILL. New England Annelida, part I, Pl. VII, Fig. 3; Pl. VI, Fig. 7. Proc. U. S. Nat. Mus., vol. II, p. 167.

WEBSTER. Annel. Chet. of Virginian Coast, p. 13.

WEBSTER. Annel. Chet., Provincetown, p. 701.

This fine Annelid occurs in the sand between tides on Bird Shoal and was often dug in 1884 and 1885 at various periods of the summer and early fall.

Family ACÆTIDÆ.

ACÆTES And. and M. Edw.**Accætes lupina** Stimpson.

STIMPSON. On some remarkable marine invertebrata inhabiting the shores of South Carolina, Proc. Boston Soc. Nat. Hist., vol. v, pp. 116, 117.

QUATREFAGES. Histoire naturelle des Annelis, vol. II, p. 674.

Of this remarkably large scale-annelid only two specimens were taken at periods of unusually low tide in July, 1885, both in muddy, somewhat grassy, areas exposed but imperfectly and for a short period. One was found in "Shark Shoal," the other with amphitrite on the edge of Crab Point Thoroughfare. The greatest length is 24 inches. The other specimen measures 16 inches, with a diameter including parapodia of 14 millimetres at the fortieth somite. The elytra are about one hundred and thirty-eight on each side, smoky black with white yellow edges; they cover the parapodia, but leave dorsal surface mostly uncovered.

General color reddish brown, lurid, not translucent, anterior 2 inches of dorsal side whitish; ventral median vessel purple. In the smaller individual taken on Shark Shoal the color is markedly lighter and more variegated.

Dorsal cirri end in acute white cones, ventral cirri small and dark red. On ventral side of parapodium several transparent elevations are noticeable anteriorly, but gradually disappear towards the posterior part of the body.

At the posterior end the body is transparent and bears flake-white anal cirri.

There can be no doubt that this is the same Annelid that Stimpson found in Charleston Harbor—agreeing as it does in all the essential characters he gives.

The larger specimen discharged great quantities of spermatozoa from openings anterior and ventral to the ventral cirri.

The peculiar tubes, suggesting those of *cerianthus* very forcibly, are one-fourth of an inch thick, made of concentric layers of tough membranous substance and inclose a lumen one-half inch wide. These tubes stand vertically in the soft mud and extend down more than two feet.

Microscopic examination of the tube shows that the layers of membrane are formed of long, yellow fibrils looking like *chitin* and identical with those figured and described by Eisig (*die capitelliden*) as secreted by Polyodontes.

Family NEPHTHYDIDÆ.

NEPHTHYS Cuv.**Nephtys bucera** Ehlers.

EHLERS. Die Borstenwürmer, p. 617, Pl. XXIII, Fig. 8.

VERRILL. Invert. An. Vineyard Sound, pp. 416, 583, Pl. XII, Fig. 58.

WEBSTER. Annel. Chet., Provincetown, p. 702.

Not uncommon in the sand of various shoals, especially upon the outer parts scarcely uncovered at low water.

Nephtys picta Ehlers.

EHLERS. Die Borstenwürmer, p. 632, Pl. XXIII, Figs. 9, 35.

VERRILL. Invert. An. Vineyard Id., pp. 348, 553, Pl. XII, Fig. 57.

WEBSTER. Annel. Chart. of Virginian Coast, p. 14.

This form would seem less common than the former with which it sometimes occurs.

Family PHYLLODOCIDÆ.

Phyllodoce (Sav.) Malmgren.

Phyllodoce fragilis Webster.

WEBSTER. Annel. Chart. of Virginian Coast, p. 14, Pl. III, Figs. 32-37.

This conspicuous small Annelid was found in considerable numbers in material dredged in shallow water in Bogue Sound and near Horse Island in June.

Family HESIONIDÆ.

Podarke Ehlers.

Podarke obscura Verrill.

VERRILL. Invert. An. of Vineyard Id., pp. 319, 559, Pl. XII, Fig. 61.

WEBSTER. Annel. Chart. of Virginian Coast, p. 16.

A small active Annelid, which like the former species and many other forms, emerges in numbers from masses of sponge, shell, etc., allowed to stand in water till it becomes impure. Dredged off Moorhead City in abundance.

Family SYLLIDÆ.

Syllis (Sav.) Ehlers.

Syllis spongicola Grube.

GRUBE. Archiv. f. naturgeschichte, 1855, Part 7, p. 104, Pl. IV, Fig. 4.

MARION & BOBRETZKY. Annel. du Golfe de Marseille, Ann. Sci. Nat. Zoöl., 6 ser., vol. 2, 1875, pp. 24-25, Pl. II, Fig. 7.

LANGERHANS. (*Haplosyllis hamata*). Die Wurmfauna von Madeira. Zeit. f. wiss. Zoöl., vol. 32, pp. 527-528.

The small Annelid identified as above, occurred in large numbers in sponges dredged off Moorhead City, in shallow water, June.

Pædophylax Clpd.

Pædophylax longiceps Verrill.

VERRILL. Proc. U. S. Nat. Mus., vol. 11, 1-79, pp. 170, 171. New England Annelida, Part 1, Pl. XII, Fig. 2.

LANGERHANS. Die Wurmfauna von Madeira, Zeit. für wiss. Zoöl., vol. 40, p. 248, Pl. XV, Fig. 2.

Sexual individuals were taken in the dip net. Eggs and young were observed in most of the stages described by Vigueir for *Erogone gemmi-*

fera Pag. to which they present great similarity. The eggs or young were attached ventrally to about 16 segments, commencing usually on the fifteenth, but in 11 specimens studied considerable variability was observed. In most cases no elongated setæ were present upon the segments bearing young.

AUTOLYTUS (Grube) Marenzeller.

Autolytus varians Verrill.

VERRILL. New England Annelida, p. 320.

Sexual forms, ♂ and ♀, were taken at the surface, which are probably identical with the forms described by Professor Verrill from the New England coast, June.

PROCERÆA (Ehlers) Marenzeller.

Proceræa tardigrada Webster.

WEBSTER. Annel. Chæt. of Virginian Coast, pp. 27-30.

Non-sexual forms, many of them in process of division, were dredged in great numbers amongst sponges, near Green Rock, in 3 to 4 fathoms, and sexual forms were taken in the tow net. From a comparison of these various forms there seems no doubt that the *Proceræa cerulea* of Webster was merely the female of *P. tardigrada*, the eggs of which are of a sky-blue color and give this color to the body before they are laid. Subsequently they are carried about in three delicate sacks on the abdomen, between the sixth and thirty second segments.

This ♀ has a dark dorsal, transverse band upon somites, 3, 6, 8, 9, 13, 17, 21, 25, 27, 29, 32, 35, 38, 42, 46, 49, 51, 53, 56, 57, 70, 71, 74, and 77, near anterior edge of each. Each parapodium bears ventrally a dark-red spot. The large lateral and swollen dorsal eyes are concealed by pigmented areas. Base of dorsal cirrus red as far as twenty-fourth somite. Body convex dorsally, flat ventrally, and laterally expanded with long parapodia, setæ and dorsal cirri in the region between sixth and twenty-seventh somites. Taken in August. The nonsexual form has pigmental bands like those of the ♀ but arranged according to a definite law or general rule to which the bands in the ♀ conform also; bearing in mind that the ♀ is formed as a cut-off part of the nonsexual stage, separating almost always just posterior to thirteenth somite and hence having thirteen less somites than that stage. In one hundred and ten individuals carefully studied only three had the bud formed just posterior to fourteenth somite; seventy-nine had an evident bud just posterior to thirteenth somite.

Having tabulated the arrangement of the colored bands in these one hundred and ten individuals there results the general rule that the bands occur upon the third and fourth somites, then upon every other or alternate one up to and including the twelfth, then (in the region of

the bud) upon every fourth one up to and including the twenty-fifth, then upon every fifth one up to and including the forty-first, after which the exceptions become so numerous that no rule is evident.

The examination of so many cases shows a definite tendency to limitation in the bands to certain somites in the anterior region and a greater and greater irregularity in the posterior region. The oldest region in each individual of the two concerned in budding is remarkably constant in respect to the coloration. Thus in the one hundred and ten cases studied the *nurse* or anterior thirteen somites presented abnormal bands as follows: On the fifth somite a band in only eleven cases; on the seventh none at all; on the ninth in only four cases; on the eleventh in only six cases; on the thirteenth in only five cases. On the fourth somite the normal band was wanting in four cases, never on the third somite. The rule of banding in the bud is not as strictly adhered to as in the above nurse. Thus bands occur abnormally upon the fourteenth somite in fifteen cases, are wanting upon the fifteenth in thirteen cases, occur upon the sixteenth in eight cases, upon the seventeenth in twenty cases, are wanting upon the eighteenth in twenty cases, and so on.

These facts seem sufficient to indicate that we have in this Syllid a marked tendency to the acquirement of a regular metamerie marking, which, however, does not coincide with the metamerision of the somites but tends to follow a special law, best expressed in the oldest part of the body in which certain alternating colored and not colored somites are distinguishable—a series of groups or combinations of somites thus following one another.

In one case, a nonsexual individual with well-advanced bud, the posterior zoöid was inverted Y shaped, being provided with two complete but not quite identical posterior ends; an abnormality previously noticed in various Annelids by many observers, but in this case striking from the length of the divided region and the activity of these two parts in the crawling movements of the whole.

Proceræa ornata Mar. and Boby.

MARION AND BOBRETZKY. Annel. du Golfe de Marseille > Ann. Sci. Nat., 6th ser., vol. 2, pp. 44-46, Pl. v, Fig. 14.

Taken in large numbers near Moorhead City on sponge, in June.

Proceræa rubropunctata Langerhaus.

LANGERHANS. Die Wurmfauna von Madeira. > Zeit. f. wiss. Zoöl., vol. 23, pp. 579, 580, Pl. XXXII, Fig. 30.

This species also occurs in abundance.

Family NEREIDÆ.

NEREIS Cuvier.**Nereis limbata** Ehlers.

EHLERS. Die Borstenwürmer, pp. 567-570.

VERRILL. Invert. An. Vineyard Id., pp. 318, 590, Pl. XI, Fig. 51; New England Annelida, part 1, Pl. v, Fig. 3, 3a; Note on Nat. Hist. of Ft. Macon (Cones and Yarrow), No. 5. > Proc. Acad. Nat. Sci. Phil., 1878, pp. 299, 300.

WEBSTER. Annel. Chæt. Virginian Coast, pp. 35, 36, Pl. VI, Figs. 70-75; Annel. Chæt., Provincetown, p. 718.

Nonsexual forms are abundant in dredging material and also under stones along the shore, where a large atoke form occurs apparently sexually mature. Heteronereis forms of both sexes were found swimming at the surface in September. In aquaria they soon died, but many of them first deposited large quantities of spermatozoa and eggs. The eggs were then fertilized and soon underwent an unequal cleavage.

Schackelford Bank, Green Rock, Horse Island, etc.

Nereis irritabilis Webster.

WEBSTER. Annel. Chæt. of Virginian Coast, pp. 31-34, Pl. v, Figs. 56-64; Pl. VI, Figs. 65-69.

Nonsexual forms were found in mud at Crab Point and Shark Shoal while epitoke female forms were taken in the tow net.

Nereis pelagica L.

MALMGREN. Annulata Polychæta, pp. 164-165, Pl. VI, Fig. 35.

EHLERS. Die Borstenwürmer, pp. 511-517, Pl. XX, Figs. 11-20.

VERRILL. Invert. An. of Vineyard Id., pp. 319-591, Pl. XI, Figs. 52-55.

WEBSTER. Annel. Chæt. Provincetown, p. 718.

Numerous small individuals collected near Moorhead.

Nereis megalops Verrill.

Nereis alacris VERRILL. Proc. U. S. Nat. Mus., vol. 11, 1879, p. 171.

Nectonereis megalops VERRILL. Invert. An. Vineyard Id., pp. 293, 592, Pl. 12, Figs. 62, 63.

Nereis megalops VERRILL. New England Annelida, part 1, p. 320.

The epitoke form originally described by Professor Verrill as *Nectonereis megalops* was taken at the surface on several occasions, while asexual forms and intermediate forms were found among Hydroids on the piles of Moorhead Wharf.

Family EUNICIDÆ.

EUNICE Cuvier.**Eunice ornata**, sp. nov.

(Plate XIII, Figs. 6-13.)

Head distinctly bilobed, each part divided in front by a transverse groove into an upper smaller and a lower much larger area. Body rounded above, flat below, tapering gradually towards posterior end.

Buccal somite as long as following three somites, ventral swelling posterior to mouth conspicuous. Antennae jointed, almost moniliform; median one longest, reaching almost to fourth setigerous somite; tentacular cirri half as long as buccal somite, jointed; anal cirri jointed, twice as long as tentacular cirri. Branchiae pectinate, beginning on fifth setigerous somite as a simple filament, rapidly increasing and meeting in an arch over the back with as many as twenty posterior branches; decreasing less rapidly, small and with few branches from about the thirtieth somite to the end of the body. Parapodia not prominent; dorsal cirrus long; ventral cirrus shorter, with swollen base; setae light colored, dorsal ones acute, flattened; ventral ones with a triangular tooth below the curved apex of outer joint; the *gauge-shaped* setae have the terminal teeth prolonged. Jaws light with dark borders; supports rounded; pinchers blunt; dental plates with eight teeth on right and five on left; unpaired plate on left side with eight teeth; posterior pair of paragnaths with each nine teeth; anterior pair smooth, dark; outer pair square, with one tooth. General color golden reddish; white spot on median line of each setigerous somite; antennae, tentacular cirri, and anal cirri white with red rings or transverse streaks. Eyes blue between outer and middle antennae. Length up to 9 centimetres; diameter, 5 millimetres. Swims actively with spiral motion.

Not uncommon on sponges, etc., in 2 to 3 fathoms in sheltered sounds. The young were also found cast up on the Fort beach, after storms, upon seaweeds.

This species appears to be closely related to *E. articulata* Ehlers.

DIOPATRA And. and Edw.

Diopatra cuprea And. et Edw.

BOSC (*Nereis cuprea*). Hist. Nat. des Vers., vol. 1, 2d ed., pp. 163-165, Pl. XII, Figs. 1-4.

QUATREFAGES (*Eunice cuprea*). Hist. Nat. des Annelés, vol. 1, p. 331.

CLAPARÈDE (*D. neapolitana*). Annel. Chart. Golfe de Naples, pp. 122-127, Pl. VI, Fig. 4.

VERRILL. Invert. An. Vineyard Id., pp. 346-393, Pl. XIII, Figs. 67, 68.

VERRILL. Notes on Nat. Hist. of Ft. Macon (Cones and Yarrow). Proc. Acad. Nat. Sci., Phil., 1878, pp. 299, 300.

WEBSTER. Annel. Chart., Provincetown, p. 270.

WEBSTER. Annel. Chart. Virginian Coast, p. 63.

EHLERS (*D. fragilis*). Die Neubildung des Kopfes bei polychaeten Anneliden. Erlangen, 1869.

This widely distributed Annelid, so common upon the northern coast of the Eastern States, was first found at Charleston by Bosc, and later at Beaufort, North Carolina, by Cones and Yarrow. From the description given by Ehlers of the specimens he received from Charleston and among which he found and studied a case of regeneration of the head and anterior somites it seems undoubtedly true that he had specimens of Bosc's *Nereis cuprea*, though he gives the new name *Diopatra fragilis*.

Among specimens taken at Beaufort is one that has reproduced a new head and several somites, just as in the case described by Ehlers. Moreover, sections show that the histological changes concerned are much as Ehlers found them. Study of this same species on the Massachusetts coast shows that this reproduction of anterior or of posterior end is a common occurrence and one of evident utility, almost a necessity, considering the habit of the animal. Its tubes are raised above the sand some inches and covered over with foreign objects, often quite long pieces of eel grass. To collect this, the creature's anterior end is protruded some distance from the protecting tube and must be a tempting morsel for fish, etc. At all events it is often cut off by some means. This is the more likely to occur since the eyes appear to be absent in this species and danger thus can not be so well avoided. After artificial removal of the head recrescence takes place inside the tube, in aquaria, with little lapse of time.

The young are sometimes taken in the tow net in July, the larger ones, 8 millimetres long, probably floating upon seaweeds, etc.

The adult is common upon the quieter, more muddy parts of Bird Shoal and near Crab Point, etc., between tides.

Diopatra magna, sp. nov.

(Plate xiv, Figs. 14-20.)

Body flat, elongated; first five or six somites, convex dorsally and turned upward so that the mouth is terminal; buccal somite small, widened at sides, as narrow above as first setigerous somite, bearing at middle of each side a smooth tentacular cirrus as long as first two setigerous somites. Head withdrawn into buccal somite; palps large, globose, with nodules anteriorly; antennæ smooth, with short annulated bases about as long as first setigerous somite; median antennæ and middle ones four times length of tentacular cirri, outer one about half the length of the median; tentacles cylindrical, with conical tips as long as bases of antennæ. Anterior five parapodia very stout, three upper ones directed forward. Branchiæ pectinate, beginning on the sixth setigerous somite as simple filaments. The number of their pinnules has increased to about twelve on the thirtieth segment, where the branchiæ meet on the back. Behind the middle of the body the pinnules of the branchiæ decrease gradually in number, the branchiæ becoming flabellate, bifid, and finally simply filiform on the posterior somites. Setæ in first five parapodia about thirteen to each, imperfectly jointed, with the hooked tips and tooth below them inclosed in a delicate hood; other parapodia bear about thirty simple pointed setæ, two stout hooked setæ, and delicate, asymmetrical, finely serrated chisel-shaped setæ. Jaw pieces dark; lower jaws with whitish tips indented on the edge; dental plates with eight teeth on right and seven on left; large pair of paragnaths with eight teeth on right and six on left; unpaired piece on left with eight teeth; two small pairs of paragnaths,

the one smooth, the other with a rounded boss. Color dark, except anterior end, which is flesh color with sprinkling of dark dots; branchiæ, dark brown; antennæ, reddish brown; body, translucent posteriorly; anus, very large; anal cirri, shorter and more slender than median antennæ. Length up to 1 meter; breadth, without parapodia, 16 millimetres; median antenna, 10 millimetres.

This species is more common than the preceding on the outer part of Bird Shoal at low-tide mark and below, constructing stout tubes which project several inches above the sand, and are covered with bits of shells, etc., and inclined to one side near the end. Young individuals, 1 centimetre long, are sometimes found in small tubes attached to the side of the large tubes—one of the few stable objects on these sand flats.

This is one of the largest Annelids of our coasts, full-grown specimens measuring upwards of 4 feet when freshly dug out of their correspondingly long vertical tubes. As they readily retire into the lower part of the tube and are easily broken into pieces in attempting to remove them, few perfect specimens can be obtained; but when the tide is rising over the tube, it is found that the animal is apt to be near the orifice and can, moreover, be more readily dug out uninjured when the tube remains under water.

The color is noticeably dark, only the anterior 3 or 4 inches being flesh color with blackish, minute spots. Posterior to about the first 7 inches the color is dark greenish brown, with translucent yellowish sides where contents of intestine do not give an opaque appearance. Branchiæ dark red-brown.

This species is readily recognized at a glance as differing from *D. cuprea* in the character of the branchiæ. It is probably this species also, and not *D. cuprea*, which produces the remarkably elongated, cylindrical masses of jelly found on the sand flats, drifted about by the tides. Each mass contains innumerable larvæ, the eggs having developed before July.

These larvæ have been figured and described by Prof. E. B. Wilson. (Studies Johns Hopkins University, vol. 2).

Both this species and the preceding are found to present peculiar strings of ovarian cells attached to the ova, both when projecting from the ovary and when floating free in the body cavity. A description of these is shortly to appear in the Journal of Morphology.

MARPHYSA Quatrefages.

Marphysa sanguinea Quatrefages.

Eunice sanguinea GRUBE. Fam. des Annél., pp. 44, 123.

LEIDY. Journ. Acad. Nat. Sci. Phil., 2d ser., part 2, vol. 3, p. 147.

Marphysa leidyi QUATREFAGES. Hist. Nat. des Annélès, vol. 1, p. 337.

Marphysa leidyi VERRILL. Invert. An. Vineyard Id., pp. 319, 593, Pl. XII, Fig. 64.

Marphysa sanguinea QUATREFAGES. Hist. Nat. des Annélès, vol. 1, p. 332, Pl. x, Fig. 5.

Marphysa sanguinea EHLERS. Die Borstenwürmer, p. 360, Pl. xvi, Figs. 8-11.

Marphysa sanguinea WEBSTER. Annel. Chart. Virginian Coast, p. 36, Pl. vi, Figs. 76-80; Pl. vii, Figs. 81-83.

There seems to be great variability in the place of occurrence of the first branchiæ; some large specimens apparently belonging to this species have no branchiæ before the fortieth segment; in other cases the branchiæ begin much sooner upon one side than upon the other.

Large individuals are occasionally found in the sand on Bird Shoal, Crab Point, Green Rock, etc.

DRILONEREIS (Clpd.) Webster.

Drilonereis longa Webster.

WEBSTER. Annel. Chæt. Virginian Coast, pp. 40-41, Pl. VII, Figs. 84-88; Annel. Chæt., Provincetown, p. 721.

Common in sand, Bird Shoal and various localities.

ARABELLA (Grube) Ehlers.

Arabella opalina Verrill.

Lumbriconereis opalina VERRILL. Invert. An. Vineyard Id., pp. 342, 594, Pl. XIII, Figs. 69, 70.

Arabella opalina VERRILL. Check List of Mar. Invert. of Atlantic Coast, p. 8; Nat. Hist. of Ft. Macon (Cones and Yarrow); Proc. Acad. Nat. Sci. Phila., 1878, p. 399; New England Annelida, part 1, Pl. IV, Figs. 4, 4a.

Arabella opalina WEBSTER. Annel. Chæt. Virginian Coast, p. 42; Annel. Chæt., Provincetown, p. 721; Annelida from Bermuda, p. 321.

One of the most common forms met with in digging in muddy sand, occurring in great numbers in some of the quiet bays and creeks.

STAUROCEPHALUS (Grube) Ehlers.

Staurocephalus sociabilis Webster.

Annel. Chæt. Virginian Coast, pp. 43, 44, Pl. VII, Figs. 89-91.

A few specimens were dredged near Green Rock in 1884, and again in 1885.

Family GLYCERIDÆ.

EUGLYCERA Verrill.

Euglycera dibranchiata Verrill.

Glycera dibranchiata EHLERS. Die Borstennürmer, p. 670, Pl. XXIV, Figs. 1, 10-28.

Rhynchobolus dibranchiatus VERRILL. Invert. An. Vineyard Id., pp. 341, 596, Pl. X, Figs. 43, 44.

Rhynchobolus dibranchiatus WEBSTER. Annel. Chæt. Virginian Coast, p. 245; Annel. Chæt. Provincetown, p. 723.

Euglycera dibranchiata VERRILL. New England Annelida, part 1, p. 296.

Occurs everywhere on the various shoals, with the following species, but perhaps less commonly than the latter.

RHYNCHOBOLUS Clpd.

Rhynchobolus americanus Verrill.

Glycera americana LEIDY. Mar. Invert. Fauna of Rhode Island and New Jersey.
> Journ. Acad. Nat. Sci. Phila., ser. 2, vol. 3, part 2, p. 117.

Glycera americana EHLERS. Die Borstenwürmer, pp. 668-670, Pl. XXIII, Figs. 42-43.

Rhynchobolus americanus VERRILL. Invert. An. Vineyard Id., pp. 342, 396, Pl. x, Figs. 45, 46; Notes on Nat. Hist. of Ft. Macon > Proc. Acad. Nat. Sci. Phila., 1878, pp. 299, 300.

Rhynchobolus americanus WEBSTER. Annel. Chet. Virginian Coast, p. 45.

Very abundant on various shoals in the harbor.

Family OPHELIDÆ.

OPHELINA (Oersted) Grube.

Ophelina agilis, sp. nov.

(Plate xv, Figs. 21-26, 28.)

Body cylindrical, smooth; preoral lobe conical, acute, long as first four setigerous somites; anal tube cylindrical, slightly larger at end than at base, length equal to about eight of the preceding setigerous somites, truncated end produced into twenty to thirty slender subequal papillæ and with a median ventral, annulated cirrus projecting from its orifice about half the length of the entire tube. Setigerous somites fifty, all except the first bearing long, tapering branchiæ dorsal to the setæ, which are expanded at the base into an anterior crest or lamella, gradually disappearing towards the apex. Setæ more than half the length of the branchiæ, acute and flattened. First setigerous somite (opposite the mouth) bears a slender cirrus about half as long as the branchia of the following somite; upon the following somite this cirrus gradually decreases in length. Proboscis thick, tongue-shaped. Length, 30 millimetres; width, 1.5 millimetres; anal tube, 1.5 millimetres; branchiæ, 1 millimetre; breadth of sole, .75 millimetres.

Common in the sand of "Spatangoid" Shoal and dredged in channel north of Lewis, Thoroughfare.

Family TELETHUSIDÆ.

ARENICOLA Lamarck.

Arenicola cristata Stimpson.

STIMPSON. On some remarkable marine invertebrates inhabiting the shores of South Carolina. > Proc. Bost. Soc. Nat. Hist., vol. 5, p. 114, 1856.

WEBSTER. Annelida from Bermuda. > Bull. U. S. Nat. Mus., No. 25.

QUATREFAGES. Histoire Nat. des Anneles, vol. 2, p. 673.

This, like the other species Stimpson found at Charleston (*Acetes lupina*), is a very large Annelid, occurring in the greatest abundance in the sand of Bird Shoal, Shark Shoal, etc., and excessively numerous in the muddy creek near Fort Macon.

The immense jelly masses, in which the somewhat salmon-colored eggs are laid, protrude from the burrows of the Annelids, and subsequently are washed about from place to place as the larvæ develop.

The number of eggs thus laid by one individual was estimated as three hundred thousand.

Their development has been noted by Professor Wilson in the paper previously referred to.

The colors when alive vary, but in general the body is greenish yellow; the branchiæ dark red; the setæ yellow, though sometimes nearly black anteriorly.

When expanded the animal measures at least 12 inches, with a diameter of above one-half an inch.

The head is very small, dark flesh color, and may be entirely retracted and concealed.

Family CHÆTOPTERIDÆ.

CHÆTOPTERUS Cuvier.

Chætopterus pergamentaceus Cuvier.

AUDOUIN AND MILNE EDWARDS. Classification des Annélides. >Ann. Des. Sci. Nat., ser. 1, vol. 30, p. 417, Pl. XXII, Figs. 1-4.

This remarkable Annelid is known to occur upon the New England coast also, being in part figured, with the larvæ also, by Professor Verrill in the Trans. Conn. Acad., vol. 4, Pl. XVII, and elsewhere described as occurring near Woods Holl, Mass. The development has been studied at Beaufort by Professor Wilson. Artificial fertilization is easily effected, and the habits of the adult well studied when kept in aquaria, each inside a glass tube of proper diameter. They then build out the ends by funnels of secreted parchment-like material. Left out of tubes the animal soon dies, becoming emaciated, with great loss of mucus.

The body is brilliantly phosphorescent, and this is easily seen to be due, as has been observed in Europe, to the presence of phosphorescent granules or minute bodies in the mucus secreted by the epidermis; this material shining brightly some time after its removal from the body, and hence not directly dependent upon nervous action.

The individuals I have since observed at Woods Holl, Massachusetts, however, do not exhibit any phosphorescence at all.

The peculiar chimney-like, upright ends of the U-shaped tube of this Annelid are rather easily found by looking over the flats, from a horizontal position, by proper illumination; but are found only in certain restricted areas, where the sand is mingled with mud and somewhat overgrown with eel-grass. In such areas on Bird Shoal and Shark Shoal, at extreme low-water mark, colonies of numerous individuals are found.

In these tubes occur the commensal crabs, *Porcellana* and *Pinnixa*, in

a surprising number of cases, considering the apparent difficulty of accounting for their presence, in pairs also, inside tubes they can not escape from.

Thus in ten tubes examined were found three pairs of *Porcellana* and four pairs of *Pinnixa*, besides a small *Pinnixa* and two very small crabs. In all cases one male and one female inhabit a single tube, though perhaps one tube was found with only a single male. The breeding season of *Chaetopterus* seems to extend over the entire summer; even on September 20 eggs were discharged from the dorsally placed nephridial openings of a female kept in the aquarium. This discharge of eggs may often be readily brought about by adding a fresh supply of sea water to replace that the animal lives in. Perhaps there is a tendency to discharge eggs at the time of rising tide.

Family SPIONIDÆ.

NERINE Johnston.

Nerine agilis Verrill.

VERRILL. Invert. An. Vineyard Id., p. 346, 600.

Very abundant in the sand on the outer beaches and at Fort Macon, perforating it with very numerous slender vertical holes. Often washed out by the waves they quickly burrow again into the sand, if not captured by birds.

POLYDORA Bosc.

Polydora cæca Webster.

Annel. Chaet. Virginian Coast, p. 52, Pl. ix, Figs. 119-122.

This Annelid is quite common, perforating dead shells.

Polydora commensalis, sp. nov.

(Plate xiv, Fig. 27.)

Body flat ventrally, somewhat convex dorsally, flattened posteriorly and rapidly tapering. Tentacular cirri in contracted state equaling diameter of body, flattened, with ciliated ventral groove. Cephalic lobe small, simple, rounded in front; lateral lobes rounded; eyes black, posterior pair smaller and nearer together. Both cephalic lobe and buccal somite usually retracted within first setigerous segment in preserved specimens. First four setigerous somites bear a dorsal and a ventral cylindrical cirrus or papilla shorter than diameter of tentacular cirrus, and with a fascicle of slender setæ at the base of each. Fifth somite, with a decreasing series of six stout, amber-colored setæ bent at tips, and with a thin lamelliform expansion on the concave side. Close to the base of these arises a small fascicle of short, delicate setæ, similar to those of the preceding somites.

Branchiæ begin upon the sixth setigerous somite, rapidly increase in length, equal half the diameter of the body and persist throughout,

though rudimentary on a few terminal somites. Anus dorsal, surrounded by an oval series of papillæ; posteriorly a pair of very small ones, next a much larger one on each side, and then five subequal and intermediate ones on each side—fourteen in all. Setæ of dorsal rami long, slender; those of first four somites more delicate and hair-like; setæ of ventral rami similar, but shorter, till twelfth segment is reached, where hooked setæ with lamella at tip appear, and gradually supplant all but one or two of the capillary setæ. Length, 25 millimetres; diameter, 1 millimetre. Color light; intestine dark; blood vessels conspicuous, translucent posteriorly. Number of somites, one hundred.

This interesting form was found in 50 per cent. of all the *Ilyanassa* shells inhabited by the small hermit crab *Eupagurus longicarpus* Stimps. and grown over by colonies of *Hydractinia*. It inhabits an imperfect calcareous tube built in the terminal spires of the shell, and a tunnel perforated through the columella to open externally just within the aperture of the shell. From this aperture the anterior part of the body is often extended. But one individual usually occurs in each shell; sometimes a second smaller one was found in the spire, whether an adult male or a young individual was not determined.

The eggs and larvæ in various stages are found within the Annelid's burrow in August, as described in a recent number of the *American Naturalist*.

Family ARICIIDÆ.

ARICIA (Sav.) And. and Edw.

Aricia ornata Verrill.

VERRILL. *Invert. An. Vineyard Id.*, p. 596.

WEBSTER. *Annel. Chæt., Provincetown*, p. 724.

Found near Crab Point in mud.

Aricia rubra Webster.

Annel. Chæt. Virginian Coast, pp. 53-55, Pl. IX, Figs. 23, 26.

Found in mud flats near the laboratory more abundantly than preceding form in 1884 and 1885.

SCOLOPLOS (Ersted.

Scoloplos robustus Verrill.

Anthostoma robustum VERRILL. *Invert. An. Vineyard Id.*, pp. 343, 597, 598, Pl. XIV, Fig. 76. Note on Nat. Hist. of Fort Macon (Cones and Yarrow), No. 5. > *Proc. Acad. Nat. Sci. Phila.*, 1878, pp. 299, 300.

Anthostoma robustum WEBSTER. *Annel. Chæt. Virginian Coast*, p. 53.

Scoloplos robustus VERRILL. *New England Annelida*, Pt. 1, p. 287.

Scoloplos robustus WEBSTER. *Annel. Chæt., Provincetown*, p. 724.

Many were dug from muddy sand.

Scoloplos fragilis Verrill.

Anthostoma fragile VERRILL. Invert. An. Vineyard Id., pp. 344, 593, 599.

Anthostoma fragile WEBSTER. Annel. Chet. Virginian Coast, p. 53.

Scoloplos fragilis VERRILL. New England Annelida, Pl. I, p. 2-7.

Scoloplos fragilis WEBSTER. Annel. Chet., Provincetown, p. 724.

Less abundant than preceding species.

Family CAPITELLIDÆ.

NOTOMASTUS Sars.**Notomastus latericius** Sars.

SARS. Fauna littoralis Norvegie, part 2, p. 9-12, Pl. II, Figs. 8-17.

QUATREFAGES. Hist. nat. des Annelés, vol. 2, p. 258.

HORST. Anneliden der Fahrten des "Willem Barents," > Nederland. Archiv. f. Zoöl., Sup. I, p. 20.

VERRILL. Brief contributions from Mus. of Yale College, No. 23, > Amer. Jour. Sci. Art., vol. 5, p. 101.

LANGERHANS. Die Wurmfanna von Madeira, iv, > Zeitt. f. wiss. Zoöl., vol. 40, pp. 259, 260.

The Beaufort specimens referred to this species are 4 centimetres in length and about 1 millimetre in diameter, and appear to belong to this rather than to any other described form, though the tori are less marked than in the figure given by Sars. Found in muddy sand, Shark Shoal and Crab Point.

DASYBRANCHUS Grube.**Dasybranchus caducus** Grube.

Dasymallus caducus GRUBE. Beschreibung neuer oder wenig bekannter Anneliden. > Archiv. f. Naturgesch., 1846, p. 161, Pl. v, Figs. 3, 4.

Dasybranchus caducus GRUBE. Fam. d. Anneliden, p. 76.

Dasybranchus caducus QUATREFAGES. Hist. nat. des Annelés, vol. 2, p. 258, 640.

The specimens referred to this species agree essentially with Grube's description of *D. caducus*. There are thirteen somites bearing capillary setæ and ramose branchiæ on many of the somites of the posterior region, but not apparently upon the more muscular anterior somites of that region, though in alcoholic specimens the branchiæ are often contracted or absent in part. Grube describes two species of *Dasybranchus* with no branchiæ and separates this genus from *Notomastus* merely by the number of somites in the anterior region (*Annulata semperiana*). As the last two somites of the anterior region belong in general appearance to the posterior region rather than to the anterior, the character of the setæ alone remains as a distinguishing mark, which seems scarcely of generic importance here.

This Annelid is found with the preceding, and more commonly than it.

Family MALDANIDÆ.

MALDANE (Grube) Malmgren.**Maldane elongata** Verrill.

VERRILL. *Invert. An. Vineyard Id.*, pp. 343, 609.

WEBSTER. *Annel. Chæt. Virginian Coast*, p. 259.

Found in mud at Crab Point and Shark Shoal. A fragment belonging, perhaps, to this genus was peculiar in having the dorsal surface of several somites thickly set with slender papillæ.

CLYMENELLA Verrill.**Clymenella torquata** Verrill.

Clymene torquatus LEIDY. *Mar. Invert. Fauna of Rhode Island and New Jersey.*
> *Journ. Acad. Nat. Sci. Phila.*, 2d ser., vol. 3, p. 146.

Clymenella torquata VERRILL. *Invert. An. Vineyard Id.*, pp. 343, 603, Pl. XIV, Figs. 71-73.

Clymenella torquata WEBSTER. *Annel. Chæt. Virginian Coast*, p. 28. *Annel. Chæt., Provincetown*, p. 731.

Not uncommon on Bird Shoal and at Crab Point.

AXIOTHEA Malmgren.**Axiothea mucosa**, sp. nov.

(Plate XVI, Figs. 29-35.)

Body elongated, somites twenty-three, of which eighteen are setigerous, while the buccal, anal, and three preanal somites bear no setæ. First six or seven somites short, middle ones elongated, posterior ones again shortened, preanal one very short. Head as long as following somite, obliquely truncated; preoral lobe conical, elongated, slightly turned upward; inclined area bordered by a flange on each side, which rises rapidly in height from near the preoral lobe, then gradually becomes less in height and somewhat undulated, and meets its fellow posteriorly on the median line, with a slight notch between; inclosed area with a slight median ridge on its anterior two-thirds, on each side of which an elongated depression separates it from the flat area at the base of the flange; in front of the mouth a lyre-shaped collection of pigment spots following the edge of the preoral lobe. Anal somite short, bell-shaped, fringed by twenty to thirty tentacles, the ventral median one about as long as the bell, a few about half this length, with a group of three to four smaller ones between each adjacent two; anus terminal, on a papillated, extensible prominence, filling the upper part of the bell. Anterior edge of fourth somite a slight fleshy rim; cuticle smooth; dorsal and ventral surfaces of middle somite covered by whitish pads. Dorsal fascicles of about twenty setæ arising from a papilliform sheath, the pinnate ones very delicate; uncini with four well-marked teeth and a fifth smaller one, and as many as ten bristles under the

hook. About twelve uncini on first setigerous somite, increasing to thirty posteriorly; color greenish, often with red or yellow shades. Fourth to seventh somites often dark. Length up to 80 millimetres; diameter, 2 millimetres.

As defined by Malmgren, this genus should have four preanal somites without setae, but Langerhans has already placed one form here with but two such somites, thinking that the number is not of as much constancy as Malmgren supposed. In all other respects this Beaufort species fits very well into Malmgren's genus.

This is one of the most abundant Annelids found at Beaufort; its sand tubes stand quite close together over large areas of Bird Shoal, projecting above the sand and often bearing a clear, gelatinous mass, cylindrical with rounded ends and about an inch long in which numerous eggs are inclosed. In these masses, exposed alternately to the air at low tide and to the water at high tide, the eggs develop and the young remain often till quite advanced. It is, I believe, this species the eggs of which have been in part the subject of Professor Wilson's paper on the segmentation of Annelids, though it was there referred to as *Clymenella torquata* (Johns Hopkins University Studies, vol. 2).

As these masses completely close the orifice of the tube the Annelid makes a new opening a few inches below the surface of the sand and thence builds up a second branch, forming thus a Y-shaped tube, one arm of which is closed at the end by the egg mass, while the other gives the Annelid access to the water.

PETALOPROCTUS Quatrefages.

(The species described below is referred to this genus as being probably closely related to the forms described by Quatrefages; yet it would be perhaps better to form a new genus for it.)

Petaloproctus socialis, sp. nov.

(Plate xvii, Figs. 36-41.)

Body elongated, composed of twenty-three somites, of which twenty-one are setigerous. Buccal somite twice the length of first setigerous somite; anal somite equal to buccal; second to fourth setigerous somites gradually increasing in length; fifth to seventeenth somites much longer; seventeenth to twenty-first decreasing rapidly; twenty-first an inch shorter than anal. Form of head varying much according to state of contraction; when expanded conical, flat below, rounded above, somewhat truncated above, ending in a crescentic rim or ridge bearing red pigment spots on the side, from which rim a median elevation runs back dorsally half the length of the head, separating a depression on the right from one on the left, while these in turn are divided by a slight elevation into an anterior and a posterior part. Mouth ventral near the anterior end of the head. Anal somite truncated dorsally and

bearing a broad, spreading lamella, which projects most at the ventral posterior part and is not prolonged anteriorly. Anus terminal somewhat below the axis of the body and the center of the area circumscribed by the flange or lamella. All except buccal and anal somites bear dorsally a fascicle of slender setæ; 4 to 5 long bilimbate ones, and a greater number of more hair-like slender ones; a few middle somites bear also a few very long undulating setæ, serrulate, with delicate lamellæ. The first three setigerous somites bear ventrally each a single stout, amber-colored spine, which is bluntly pointed, transversely striate below, and projects plainly beyond the cuticle.

The other setigerous somites bear a single row of uncini, about ten in the fourth setigerous somite and twenty in the posterior ones; each has five teeth and a single stout bristle crossing over the main tooth. Length up to 100 millimetres, diameter 3 millimetres. Color variable, brown, flesh-color, dark red; fourth to ninth somites often darker.

This Annelid constructs thick, coarse tubes of sand, often cemented together in groups and coiled and convoluted a few inches below the surface of the sand, forming thus firm clumps into which the Annelid retreats and from which entire individuals can be taken only with difficulty, as the body breaks with the tube. Parts at least of many individuals are thus protected from storms and other destructive agents. Many are found with newly-formed heads or posterior ends. This is a common form on the outer edge of Bird Shoal and is sometimes exposed at very low tides, living in sand mingled with shells or fragments.

Family AMMOCHARIDÆ.

AMMOCHARES Grube.

Ammochares ædificator, sp. nov.

(Plate XIV, Figs. 42-45.)

Body cylindrical, smooth, tapering posteriorly, divided by bands of uncini into eighteen to twenty-one sections, the first six very long, subequal, forming about two-thirds of the entire length, following sections rapidly becoming very short. Body terminates posteriorly, simply, conically with slit-like anus; anteriorly in crown of tentacles surrounded by a delicate membranous collar. The tentacles present five chief fleshy stems on each side, branch four times, generally dichotomously, and end in blunt lobules; dorsally they are separated by a median, slightly triangular lobe and ventrally by an interval. Mouth terminal with three fleshy lobes or lips, one dorsal, two lateral. First section of the body bears two fascicles of setæ on each side; the posterior one is near the middle of the section and contains about one hundred setæ; the anterior one is halfway between the posterior and the tentacles and contains fewer setæ. There is, moreover, a small fascicle of about twenty setæ nearer the dorsal line and quite near the posterior end of the section

which has apparently not been observed in other species of this genus. The dorsal fascicles above the bands of unncini contain about fifty setae and are closely approximated dorsally on the anterior segments farther apart posteriorly. Bands of uncini nearly meet ventrally on the anterior segments and are there composed of twenty-five vertical rows of hooks. Each uncinus has two equal teeth. Length up to 50 millimetres; diameter, 3 millimetres. Color, light reddish; tentacles variously marked with white, red, and green.

It constructs elegant cylindrical tapering tubes often 15 centimetres long and 6 millimetres in diameter, which are covered with worn discolored fragments of shells, densely packed and generally set at an angle to the axis of the tube. The tubes stand buried in the sand.

These Annelids in their tubes are not uncommon in certain restricted shelly areas of Bird Shoal toward Fort Macon, where scarcely uncovered by the tide. The excrement is discharged as cylindrical masses half the length of the body, composed of excessively fine sand held together by mucus.

Family HERMELLIDÆ.

SABELLARIA Lamarek.

Sabellaria vulgaris Verrill.

Sabellaria vulgaris VERRILL. Invert. An. Vineyard Id., pp. 321, 611, Pl. xvii, Figs. 88, 88a; Notes on Nat. Hist. of Ft. Macon (Cones and Yarrow), >Proc. Acad. Nat. Sci. Phila., 1878, pp. 299, 300; New England Annelida, part 1, p. 318.

Sabellaria varians WEBSTER. Annel. Chart. Virginian Coast, p. 59, Pl. ix, Figs. 133-137; Pl. x, Figs. 137-139.

This Annelid is common on shells, etc., in a few fathoms of water. The females are colored brilliant purplish by the mature eggs, and the smaller males dull white when distended with spermatozoa. The eggs are easily fertilized artificially, but develop with many individual irregularities and abnormalities. The cleavage is not like that figured recently by von Drasche for a European species of *Sabellaria*.

Family AMPHICTENIDÆ.

PECTINARIA Lamarek.

Pectinaria gouldii Verrill.

Cistenides gouldii VERRILL. Invert. An. Vineyard Id., pp. 323, 612, Pl. xvii, Figs. 87, 87a. Proc. Acad. Nat. Sci. Phila. (Cones and Yarrow), 1878, p. 300.

Cistenides gouldii WEBSTER. Annel. Chart., Provincetown, p. 731.

Pectinaria gouldii VERRILL. New England Annelida, part 1, p. 287.

Found occasionally in the sand near low-water mark; Shark Shoal and Bird Shoal. The beautiful conical tubes appear to be placed, normally, with the apex near the surface of the sand, the large orifice and head of Annelid buried deeply, but do not stand vertically. Large eggs are found in the body cavity in August.

Family TERESELLIDÆ.

AMPHITRITE (Müller) Malmgren.

Amphitrite ornata Verrill.

Terebella ornata LEIDY. Mar. Invert. Fauna. Rhode Island and New Jersey. > Jour. Acad. Nat. Sci., 2 ser., vol. 3, p. 146, Pl. XI, Figs. 44, 45.

Amphitrite ornata VERRILL. Invert. An. Vineyard Id., pp. 320, 613, Pl. XVI, Fig. 82.

Amphitrite ornata WEBSTER. Annel. Chæt. Virginian Coast, p. 62; Annel. Chæt., Provincetown, p. 732.

The specimens examined differ considerably from the northern form in the shape of the uncini, to judge from the figures given by Leidy; but not knowing the degree of accuracy of these figures nor the limits of individual variation in these characters, I have referred the specimens to *A. ornata*. Common in soft mud near Crab Point; many small individuals occurred in mud tubes amongst hydroids, ascidians, etc., upon the bottom of an old scow anchored in deep water.

LOIMIA Malmgren.

Loimia turgida, sp. nov.

(Plate XIV, Figs. 46-49.)

Body much swollen anteriorly, slender posteriorly, smooth dorsally, somites scarcely distinguishable. Tentacles longer than body in extension, in alcohol not reaching to sixteenth setigerous somite; much more slender than the stem of the branchiæ. Ventral shields nine, length about equal; breadth of the first about one half greater than that of the ninth: first one represents the ventral surface of the second, third, and fourth somites and is indistinctly divided into two. The elevated region formed by the shield is continued on the following six somites as a series of folds, three to four for each somite, decreasing in width in the same proportion as the shields. Lamella of the second to third somites large, oblong. Some of the uncini bear six teeth instead of five, the usual number. Anus surrounded by about ten blunt papillæ. Color greenish-white, tentacles crossed by about fifty bands of brown-red pigment. Length, 60 millimetres; diameter, 4 millimetres; tentacles, 12 millimetres; breadth of first shield, 3.7 millimetres; of ninth shield, 2.5 millimetres. Number of somites about ninety; setigerous somites seventeen.

The tentacles break off readily in alcohol, being attached by means of a small swollen area, below which is a similar but smaller process beyond the end of the ventral groove, so that the broken off tentacles have the appearance of being cleft or bilobed at the end. Found under stones along the shore.

LEPRÆA Malmgren.

Lepræa rubra Verrill.

VERRILL. Invert. An. Vineyard Id., pp. 382, 615, 616.

WEBSTER. Annel. Chæt. Virginian Coast, p. 63.

Collected upon oyster shells near Horse Island.

POLYCIRRUS (Grube) Malmgren.**Polycirrus eximius** Verrill.

VERRILL. Invert. An. Vineyard Id., p. 616, 320, Pl. xvi, Fig. 85.

WEBSTER. Annel. Chet. Virginian Coast, p. 63, Annel. Chet. Provincetown, p. 735.

Dredged near Green Rock in 1884 and in 1885.

Family **SABELLIDÆ**.**SABELLA** (L) Malmgren.**Sabella microphthalma** Verrill.

VERRILL. Invert. An. Vineyard Id., pp. 323, 618; Nat. Hist. Ft. Macon (Cones and Yarrow), > Proc. Acad. Nat. Sci. Phila., 1878, pp. 299, 300.

WEBSTER. Annel. Chet. Virginian Coast, p. 65; Annel. Chet., Provincetown, p. 735.

Common amongst masses of sponge in shallow water near Moorhead City and Horse Island.

PROTULIDES Webster.**Protulides elegans** Webster.

Annelida from Bermuda, > U. S. Nat. Mus. Bull., No. 25, 1884, pp. 325, 326, Pl. xi, Figs. 63-74.

This Annelid is not uncommon on shells, etc., in a few fathoms of water in Bogue Sound. In coloration the specimens agree closely with those described by Professor Webster, which were also collected at Beaufort, but the occurrence of double rows of uncini upon the abdominal segments seems not to be constant.

Family **SERPULIDÆ**.**HYDROIDES** Gunnernus.**Hydroides dianthus** Verrill.

Serpula dianthus Verrill. Invert. An. Vineyard Id., p. 620.

Hydroides dianthus Verrill. Proc. Acad. Nat. Sci. Phila. (Cones and Yarrow), 1878, p. 300.

Hydroides dianthus Webster. Annel. Chet. Virginian Coast, p. 266; Annelida from Bermuda, p. 327.

Young individuals were found on seaweed cast up on the beach, while the mature forms of both sexes are common upon shells, which have been brought up onto Bird Shoal by storms or are dredged in Bogue Sound, etc.

In the preceding list of fifty-seven species of Polychætæ found at Beaufort I have endeavored to avoid the making of new species, but have nevertheless found it necessary to describe the following ten as new: *Harmothoe aculeata*, *Eunice ornata*, *Diopatra magna*, *Ophelina agilis*, *Polydora commensalis*, *Ariothea mucosa*, *Petaloproctus socialis*, *Ammochares edificator*, *Loimia turgida*. Of the other species the fol-

lowing four are new to America: *Syllis spongicola* Grube, *Proceræa ornata* Mar. and Bob., *P. rubropunctata* Langerhans, *Dasybranchus caducus*.

Four genera are represented in the Beaufort fauna not previously known to occur in America: *Ophelina*, *Dasybranchus*, *Petaloproctus*, *Loimia*; while *Ammochares* is known only as mentioned in a list of Annelids dredged in the Gulf of Maine by Professor Verrill (Am. Jour. Arts and Sci., v. 7, 1874, p. 411) and is a member of a family, *Ammocharidae*, not otherwise represented on the coast of the United States, as far as known; a fragment belonging to this genus was, however, found in Virginia. Of the twenty-four families represented, the *Syllidae* have six, the *Eunicidae* have seven species, while the *Maldanidae* are represented by four; however, the forms living in sand are probably unduly emphasized in this collection, since the unusually large areas of sand flat nearly exposed at low tide furnished such advantages for collecting such species, especially in the warm waters of that coast, that other localities were less visited. From Ehler's monograph upon the *Blake* collection, and from a collection I have made at Green Turtle Cay, Bahamas, it would seem that the *Eunicidae* is the most richly represented family along the warm coasts of the southern United States and neighboring islands.

Besides the adult Annelids given in the above list young and larval forms were taken in the tow net, often in great abundance. Among the most beautiful of these were immature specimens of *Tomopteris*, resembling *T. Rolasi* Greef, taken on several occasions in the inlet.

Young *Lepidonotus* with long provisional setæ were common, as were the larvæ of *Chaetopterus*. *Nereis*, as egg, larva and young, was abundant; the eggs and early larvæ being conspicuous as having large oil drops in the transparent floating cells surrounded by invisible jelly.

One of the most interesting and abundant forms in the tow net is the young of *Loimia turgida*. It floats about inside a gelatinous tube longer than the body and much thicker than those figured by Claparède as occurring about young *Terebella conchylega*. In such larvæ the otocysts are conspicuous, anterior to the first pair of setæ; the tentacles come in gradually in pairs, one each side of a longer median one; colored spots appear early upon the tentacles; the branchiæ appear from before, posteriorly, at first as simple tubercles; two large and numerous small pigment spots are present.

A young *Arenicola* was found in a similar gelatinous tube; here also large otocysts are present, one on each side, dorsally, in the anterior part of the buccal somite; each contains a single large otolith.

Young *Scoloplos*, *Euglycera dibranchiata* V., and many unknown larvæ, were taken. The *Spionidae* were especially well represented in surface collections, several forms of *Polydora*, a *Nerine*, a *Prionospio* with pinnate branchiæ and tentacles, and the remarkable larvæ of *Magelona* almost identical with those figured and described by Cla-

parède (Beobachtungen, Normandie, 1863) as well as larvæ like those in Pl. VI, of the above-cited work, but having only smooth setæ except in certain older specimens.

A Mitraria was occasionally observed and reared to a stage having nine somites and a single row of uncini, numerous upon the middle somites. The shape of these uncini suggests what is found in the adult Ammochares, but though these Annelids were kept in aquaria for three months no fertilized eggs were obtained, and so the question is an open one as to the reference of Mitraria to Ammochares.

Polygordins larvæ, having red eye spots and a row of red and of yellow areas, occur at certain periods, somewhat abundantly.*

EXPLANATION OF PLATES.

PLATE XII. *Harmothoe aculeata*, sp. nov.

- Fig. 1. Side and face view of ventral seta and side view of dorsal seta.
- Fig. 2. Part of posterior edge of one of larger elytra.
- Fig. 3. Parapodium.
- Fig. 4. Dorsal view of head and extended proboscis.
- Fig. 5. One of smallest elytra.

PLATE XIII. *Eunice ornata*, sp. nov.

- Fig. 6. Dorsal view of anterior end, from living specimen.
- Fig. 7. Jaws r^1 r^2 r^3 r^4 on right side; l^1 l^2 l^3 l^4 on left side; L, unpaired piece on left side; V, ventral pieces; D, main dorsal jaws.
- Fig. 8. Dorsal view of posterior end, living specimen.
- Fig. 9. Fourth parapodium on right side.
- Fig. 10. Four setæ from parapodium of forty-fifth somite.
- Fig. 11. Parapodium of forty-fifth somite.
- Fig. 12. Parapodium of seventeenth somite.
- Fig. 13. Blunt seta of ventral part of parapodium of forty-fifth somite.

PLATE XIV. *Diopatra magna*, sp. nov.

- Fig. 14. All jaw pieces; letters as in Fig. 7.
- Fig. 15. Parapodium of fourth somite, right side.
- Fig. 16. Right parapodium, posterior to two hundredth somite.
- Fig. 17. Right parapodium of seventeenth somite.
- Fig. 18. Posterior end, dorsal view.
- Fig. 19. Three setæ of anterior somite and tip of large seta from fortieth somite.
- Fig. 20. Side view of anterior end of body.

PLATE XV. *Ophelia ugilis*, sp. nov., and *Polydora commensalis*, sp. nov.

- Fig. 21. Side view of entire animal: live specimen.
- Fig. 22. Side view of expanded branchial apparatus; A, anterior, and P, posterior.
- Fig. 23. Extended proboscis.
- Fig. 24. Dorsal view of anterior end, from living specimen.

* I may here add a list of a few Polychæte collected at the mouth of the Chesapeake, at Lynnhaven, in April, 1888. *Nephtys buccra* Ehlers, *Euglycera dibranchiata* Verrill, *Scoloplos robustus* Verrill, *Scoloplos fragilis* Verrill, *Ophelia simplex* Leidy, *Hydroides dianthus* Verrill.

Fig. 25. Ventral view of posterior end, living specimen.

Fig. 26. Parapodium, with branchia.

Fig. 27. Large seta of fifth somite and common hook seta of *Polydora commensalis*.

Other figures published in the American Naturalist, 1891.

Fig. 28. Large and minute setæ of *Ophelina agilis*, sp. nov.

PLATE XVI. *Axiotea mucosa*, sp. nov.

Fig. 29. Entire animal, from living specimens.

Fig. 30. Side view of anterior end, from living specimens.

Fig. 31. Ventral view of anterior end, living specimens.

Fig. 32. Dorsal view of anterior end, living specimens.

Fig. 33. Posterior end, living specimen.

Fig. 34. Tube in sand, old orifice stopped by jelly mass containing eggs, new orifice at end of a side branch of tube.

Fig. 35. Four setæ.

PLATE XVII. *Petaloproctus socialis*, sp. nov.

Fig. 36. Entire animal, live specimen.

Fig. 37. Dorsal view of anterior end, live specimen.

Fig. 38. Posterior end, live specimen.

Fig. 39. Ventral view of anterior end.

Fig. 40. Tube in sand, showing coiled part beneath surface.

Fig. 41. Four setæ.

PLATE XVIII. *Ammochares edificator*, sp. nov., and *Loimia turgida*, sp. nov.

Fig. 42. Entire animal, living specimen.

Fig. 43. Oral surface with expanded branchiæ, diagrammatically drawn from living specimens; D, dorsal; V, ventral.

Fig. 44. Seta and uncinus.

Fig. 45. Tube in sand, spindle-shaped near surface; of leathery consistence.

Fig. 46. Young *Loimia turgida* in floating, transparent tube.

Fig. 47. Base of tentacle of adult *L. turgida*.

Fig. 48. Setæ of adult *L. turgida*.

Fig. 49. Uncinus of adult *L. turgida*.